have priority; *Anthemodes articulata*, Hkl., *Bathyphysa gigantea*, Hkl.

Numerous are the species named from living or preserved specimens, for the descriptions of which the readers of this "monograph" are referred to the forthcoming "Morphology," such as *Strobalia cupola*, Hkl. "This beautiful species was observed living by me in the Indian Ocean, and will be described in my 'Morphology of the Siphonophoræ'; a fragment of a similar species, *S. conifera*, was collected by the *Challenger* in the South Pacific (Station 288)" (p. 243); and again, "*Auralia profunda*, the single species of this genus which I have examined, was taken in the depths of the tropical Atlantic, and will be described in my 'Morphology,' &c." (p. 301).

We have probably quoted enough to show the very uneven treatment that has been meted out to the species of this class. Two hundred and forty of them are referred to by name, but only a small percentage of these are diagnosed; of those that are, some of them were found during the voyage of the *Challenger*, some of them were found by Prof. Haeckel during his own memorable and fruitful sojourns at Madeira and Ceylon, but for many of them we have nothing more than names. There is no doubt that to have made this Report a "monograph" a larger volume, perhaps another volume, would have been needed; but had it been kept within the limits of a Report on the *Challenger* species, it would not have occupied the space it at present does.

The volume contains 380 pages, and is illustrated by 50 plates, several of which are beautifully printed in colours. The plates were in some instances printed off before the text was printed; and of those coloured, all but one are after original coloured drawings of the author's. Amidst the number of strange, beautiful, and interesting forms described and figured, it is hard to make a selection; perhaps the greatest interest will be taken in the forms belonging to the new order of the Auronectæ. In this order there is present a peculiar and most remarkable organ, called the air-bell or aurophore: "it seems to be the modified umbrella of a medusome, and is adapted for the production and emission of the 'gas' contained in the large pneumatophore; the trunk of the siphosome is also thickened and bulbous, and traversed by a network of anastomosing canals, similar to the fleshy or cartilaginous cœnosome of the Alcyonidæ." There are two families, Stephalidæ and Rhodalidæ. The family Stephalidæ has two genera, Stephalia and Stephonalia. Of the former genus, the single species *S. corona* was found by Dr. Murray during the *Triton* Expedition, in the Faroe Channel; and of the second genus the single species *S. bathyphysa* was found by the *Challenger* in the South Pacific. The family Rhodalidæ also contains two genera, Auralia and Rhodalia. Of the first of these, *A. profunda*, as before mentioned, "the single species of this genus which I have examined was taken in the depths of the tropical Atlantic, and will be described afterwards in my 'Morphology of the Siphonophoræ.' Its external appearance is similar to that of *Stephalia corona;* but the nectophores of the simple corona are more numerous and the tentacles are of the same shape as in Rhodalia." As this is all we are told about the species, we cannot be certain whether it was a *Challenger* form or not. Rhodalia likewise has but one species, *R. miranda*. This wonderful form is described from specimens taken at Station 320, south-east of Buenos Ayres, and is figured on Plates 1–5.

Prof. Haeckel thinks that these Auronectæ are permanent deep-sea Siphonophoræ, which may move up and down within certain limits of depth, but never come to the surface. He regards their discovery as one of the most splendid made during the cruise of the *Challenger;* yet for a knowledge of what is known about them we must look beyond the pages of this Report.

A species of Anthophysa, taken at Station 334, has been called *A. darwinii*. Several other species are alluded to by name; it seems possible that Merten's manuscript name Anthophysa, published by Brandt, in 1835, is preoccupied by Bory de Saint Vincent for a genus of flagellate Infusoria.

In addition to the author's preface, and the general introduction, there is the usual description of the families, genera, and species, the deficiencies in which we have sufficiently alluded to. This is followed by a bibliography of the Siphonophoræ; a list of the families, genera, and species; a very useful glossary of the terms used in Latin, English, and German; and lastly, a statistical synopsis, from which we learn that 85 genera are enumerated, these containing 240 species. The diagnoses of 47 new species are given in this Report, of which 27 were found by the *Challenger*.

The characteristics of the orders and families are given in most satisfactory detail, and this portion of the Report would in itself constitute a most important and valuable general history of the group, and must serve for the ground-work of all future writings on the subject.

If too much has been claimed for this meritorious contribution to natural science from a monographical point of view, such a claim in no way takes from its merits as a profoundly important contribution to natural science.

THE ENCYCLOPÆDIC DICTIONARY.

The Encyclopædic Dictionary. Vol. VII., Part II. (London: Cassell and Co., 1888.)

ALL concerned in the production of this work may be congratulated on the completion of their undertaking. It is a work of more than ephemeral interest, and well deserves the favourable reception which has already been accorded to it. It was planned seventeen years ago, and the first divisional volume appeared in 1879. The intention at that time was that the Dictionary should consist of twelve divisional volumes, but, as the execution of the scheme went on, it became obvious that, unless the contents of the concluding volumes were to be presented in a very inadequate form, two additional divisional volumes would be necessary. It was arranged that these volumes should be supplied, and thus ample opportunity was provided for the maintenance, to the end, of a high standard of excellence.

The scale on which the work has been done may be seen from the fact that in round numbers it contains some 180,000 words or headings. This is a great advance on earlier dictionaries. The new edition of the Imperial Dictionary, which stands next, has 130,000 headings; the latest edition of Webster's Dictionary, with supplement, has 118,000; the early edition of Webster had

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70,000; and Todd's edition of Johnson's Dictionary had 58,000. Even a general statement of the number of headings does not give an adequate impression of the amount of the contents of the present work, because, as pointed out in the preface, each word has been subdivided as far as possible into the various meanings which it has assumed at different times.

Judged simply as an ordinary dictionary, the work has high merits. No doubt, when Dr. Murray's vast undertaking is completed, both this and all other existing dictionaries will seem in many respects deficient; but for the present we do not know that anyone wishing to possess, for frequent reference, a sound, thoroughly trustworthy dictionary, could anywhere find his want more satisfactorily supplied than in these volumes. The question, what words can legitimately claim admission, had of course to be met at the outset, and it has been settled in a way that will commend itself to the judgment of all persons competent to form an opinion on the matter. All technical terms, so far as known, have been included; slang words, colloquialisms, and provincialisms have not been wholly omitted; specially coined words have also, in some instances, been recognized; and due respect has been shown to seminaturalized words and to hybrid compounds. The department of etymology, we need hardly say, has received much careful attention; and great pains have been taken to provide quotations illustrative of every sense of each word, with references as full as could be given. The pronunciation of words is clearly indicated, and the adoption of various styles of type makes it easy for persons using the Dictionary to distinguish between various divisions and subdivisions of words.

As the title indicates, it is not merely as a dictionary that the work should be estimated. The aim has been to combine the advantages of a dictionary with those of an encyclopædia, and this idea has been realized with a remarkable degree of success. No one will expect to find here, under any heading, full information, such as one reasonably looks for in a great encyclopædia. Nothing of this kind has been attempted. But under each heading the thing is described as well as the word; and although the descriptions are necessarily brief, they are, so far as they go, clear and accurate, and no one who refers to them will afterwards have to unlearn anything they may have taught him. The short articles relating to the various branches of natural science are especially well done—a fact which will be readily understood when we say that the editor and publishers acknowledge the services of many eminent scientific workers, including Prof. Huxley, Dr. Sclater, Dr. Günther, and Mr. Carruthers.

OUR BOOK SHELF.

Manuel Pratique de Cristallographie. G. Wyrouboff. (Paris: Gauthier-Villars et Fils, 1889.)

MANY books have been written about crystallographic calculation, and their size and the uninviting appearance of their contents have probably created an impression that there is something peculiarly difficult in the subject. M. Wyrouboff's manual will not, we fear, dispel this erroneous idea, for about 300 of his pages are devoted to an exposition of the methods of calculation; but the book, being eminently practical, consists almost entirely of examples, which are fully worked out by simple and intelligible methods, while very little space is wasted upon the geometrical principles involved. The work is therefore very different in character from the geometrical treatises which have frequently adorned the subject, and will doubtless be of great use to the class for whom it is written—namely, "those to whom crystallography is only a means for the determination and description of species," to whom and to all who are attempting to acquire a practical knowledge of crystallography it may be warmly recommended. We would only suggest to such two words of caution: in the first place, the calculations are in each case conducted in two ways, by means of plane angles and solid geometry, and by means of spherical trigonometry,—the former method is unnecessary and undesirable; in the second place, the Millerian axes and notation of three indices should certainly be used in the rhombohedral system in preference to the notation of four axes.

M. Wyrouboff is so well known as the author of valuable contributions to the science of crystallography (by which we mean the knowledge of the relation between the physical, chemical, and geometrical characters of crystals as distinguished from either the study of mineralogy or the art of crystal-measurement), that the following remarks, taken from his preface, deserve particular attention:—

"How far more advanced would be our knowledge of the intimate structure of bodies if chemists were to describe accurately the form of the innumerable substances which issue from their laboratories, and which, being sometimes accidentally obtained, difficult to reproduce, or prone to rapid decomposition, are lost to science; and if, on the other hand, physicists were accustomed to connect the properties which they discover with the symmetry which belongs to the crystalline exterior. It is true that in doubtful cases, or such as are of particular interest, they both have willing recourse to the professional crystallographer; but, apart from the fact that he is not always at hand, experience teaches that such a division of labour rarely gives good results. Forms placed in arbitrary positions without regard to the forms of allied substances often serve only to conceal the analogies which are professedly sought," &c.

From which we gather that the position of crystallography in France is much the same as in England, and that such books as that of M. Wyrouboff, although not liable to be choked by the thorns of competition, are at present somewhat likely to fall upon the stony ground of indifference.

Assistant to the Board of Trade Examinations. By Captain D. Forbes, F.R.A.S. (London: Relfe Bros., 1888.)

IN preparing candidates for the Board of Trade examinations for officers' certificates, Captain Forbes has felt the want of a handy book of reference to the various questions asked, and he hopes to supply that want by the little book before us. In these examinations, the candidate has to show his knowledge by answering a number of a set of questions which is the same from year to year, although those selected by the examiner may be different. The questions put to the candidates, and the answers to them which the author suggests, are given in this little book. As examples of brevity, the definitions given of the various astronomical terms are unequalled in any book we are acquainted with. Thus, right ascension is defined as "the distance which a heavenly body is eastward of the first point of Aries"; while not the slightest idea is given of the meaning of the latter term. On p. 14, sidereal *time* is stated to begin when the first point of Aries is on the meridian, and to *end* when it returns to it

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